



Insights on Ecological Effects of Coal Development in the Eastern Slopes

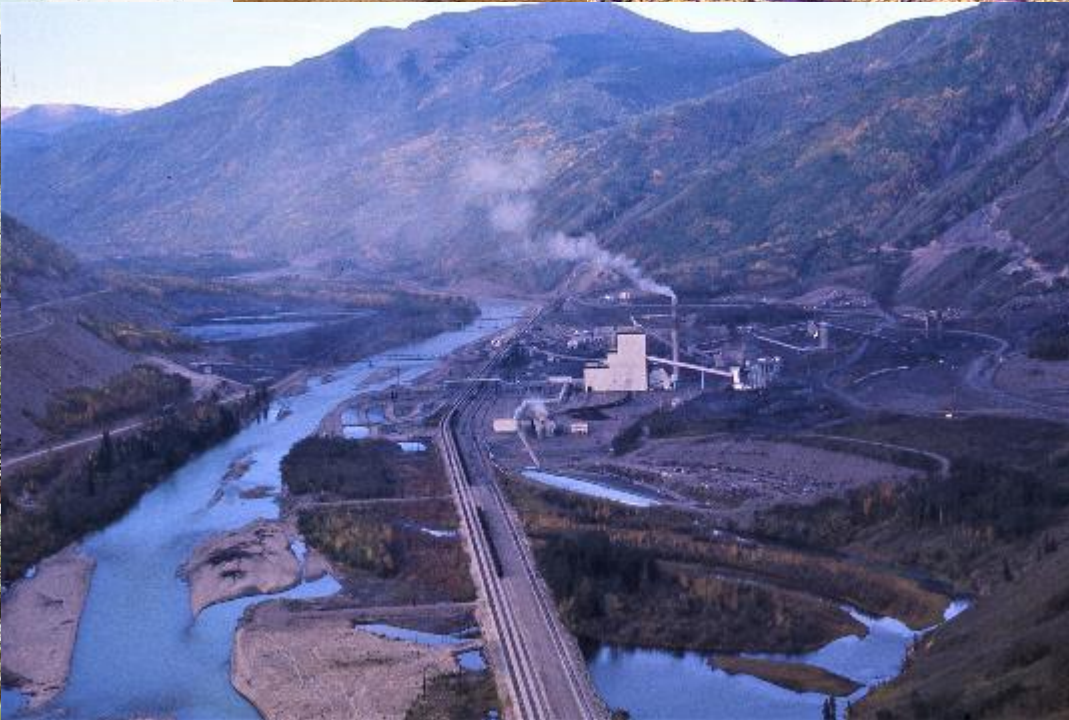
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Submission to the Coal Policy Committee
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What does coal
development look like?





Tent Mountain-1970s



Tent Mountain-2000s





Cumulative Effects at a Watershed Scale



**In Memory of
Crowsnest
Bull trout
Pleistocene- 1965
Gone and forgotten**

The Reality of a Shrinking Pie

1850



1900



1930



1950



2016



2000



1980



1960



Because we focus on the immediate we miss the additive impact of
the past



Road Density



0.25km/km²



0.50km/km²



1.0km/km²



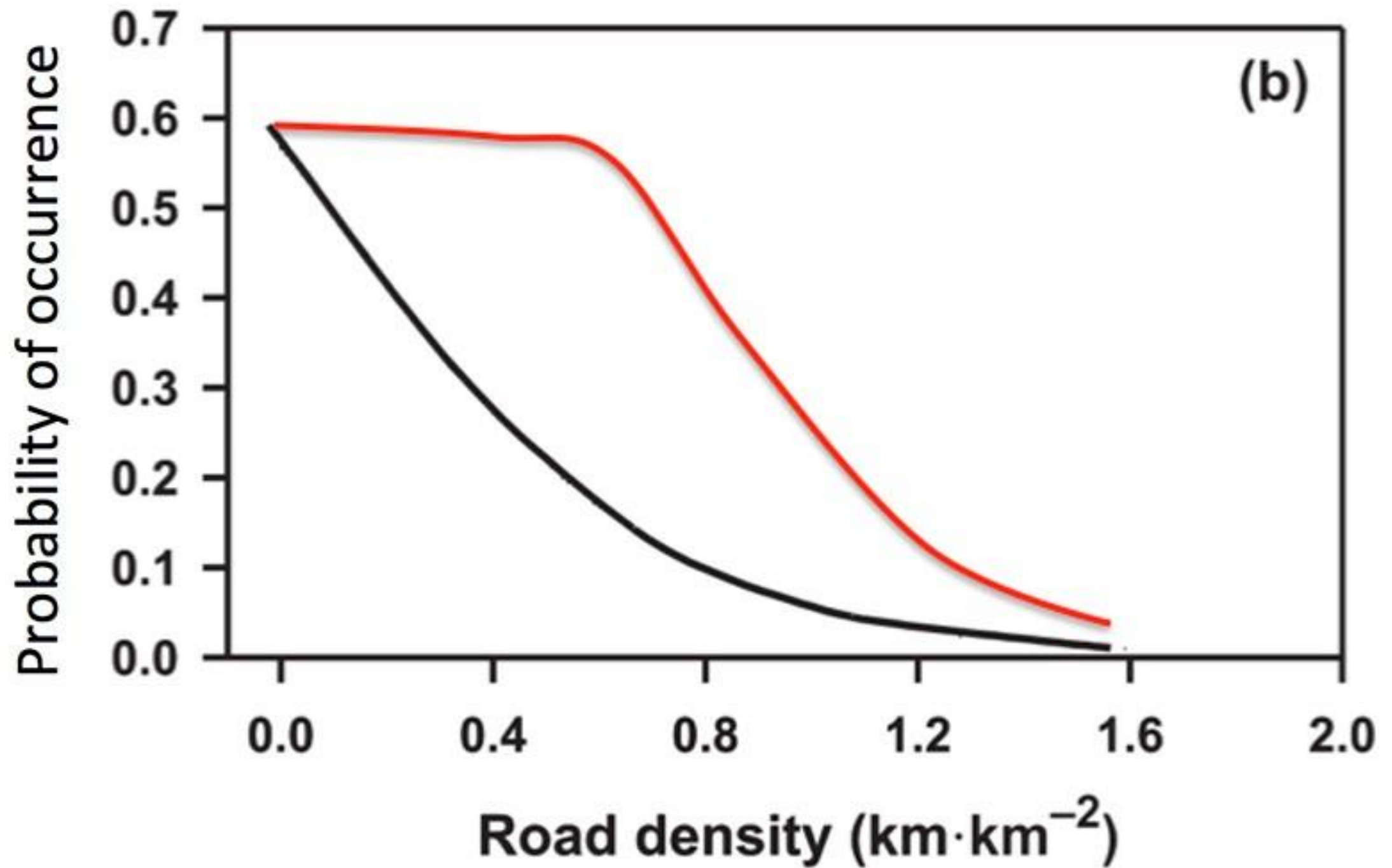
2.0km/km²



4.0km/km²



6.0km/km²





“The results of this exercise indicate cumulative effects of overlapping land uses present substantial risk to bull trout and Westslope cutthroat trout in the Southern East Slopes” (ALCES 2020).

Special Concern



Uncertain



Endangered



Threatened



Threatened

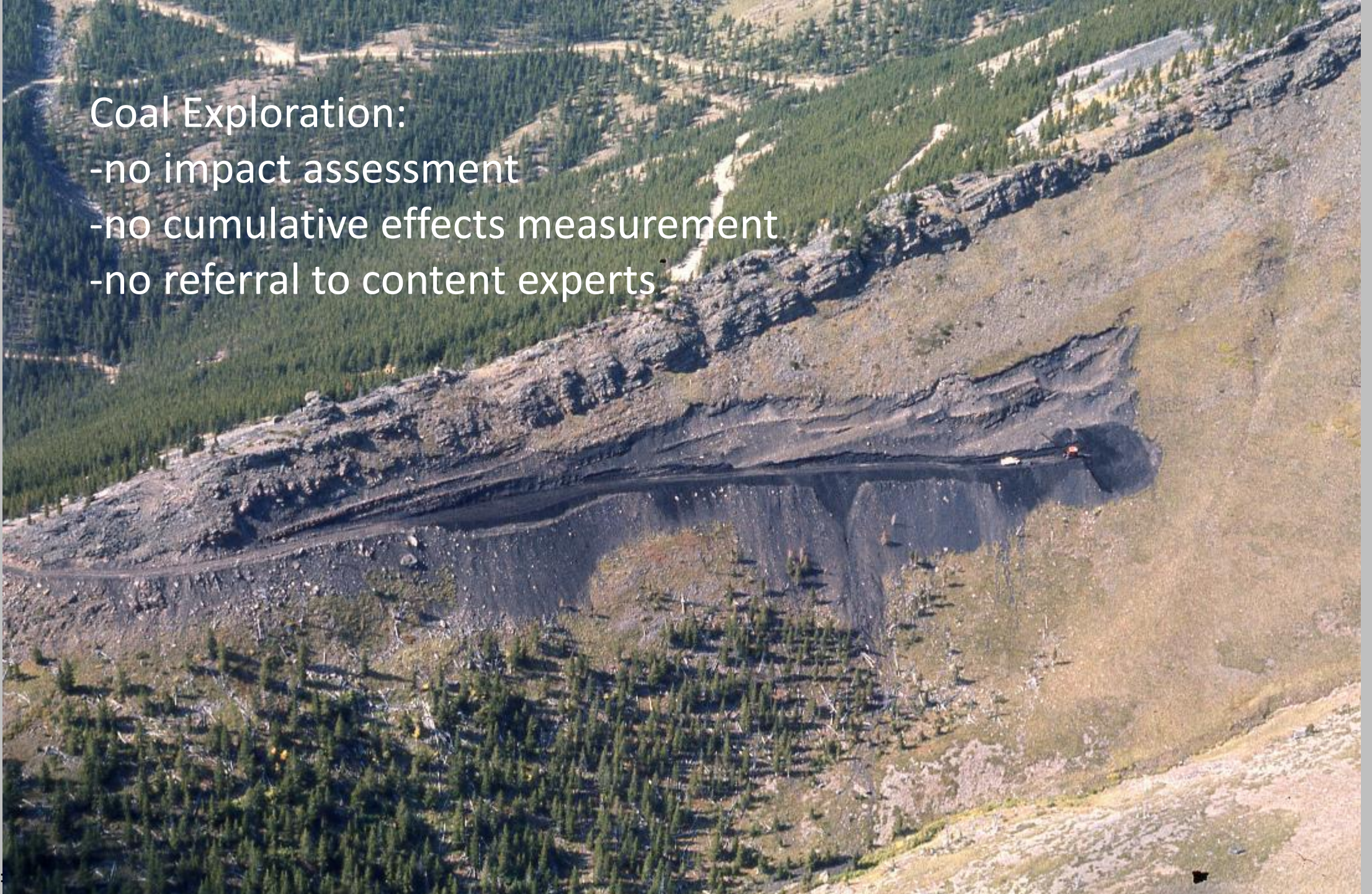


An aerial photograph showing a large-scale coal mine development in a mountainous region. The foreground and middle ground are dominated by dark, steep slopes of coal and waste rock, with visible tracks and infrastructure. In the background, snow-capped mountain peaks rise against a clear blue sky. The text "Coal mine development" is overlaid in white in the center of the image.

Coal mine development

Coal Exploration:

- no impact assessment
- no cumulative effects measurement
- no referral to content experts



Coal Exploration:
-no site inspection
-no monitoring or oversight





Coal Exploration:
-vague reclamation
-no performance bond

Mine Development: -site preparation



Mine Development:
-scale



Mine Development:

- water capture and containment




Coal Mine “Wrecks”

In our experience, **every** open-pit coal mine in the Eastern Slopes had repetitive operational and structural failures that affected water quality and aquatic environments. These resulted from:

- significant topographic constraints
- planning failures
- low design standards
- economics overrode environmental protection
- monitoring failures
- failure of oversight and regulatory enforcement

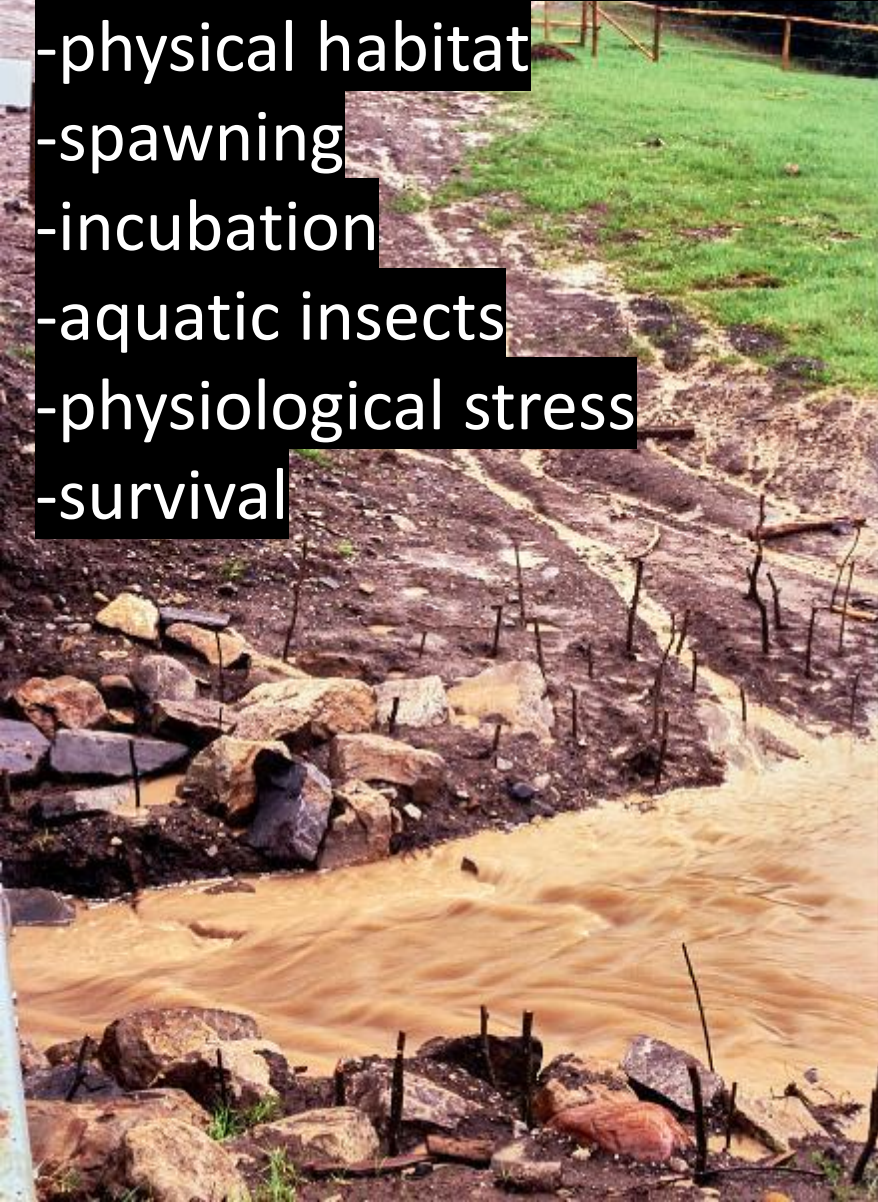


A photograph of a large, eroded hillside. The hillside shows distinct horizontal geological layers, with some areas appearing dark and others lighter. A small stream or gully is visible at the base of the hill, flowing through the eroded material. The sky is clear and blue. The overall scene illustrates the effects of coal mining on erosion and sediment transport.

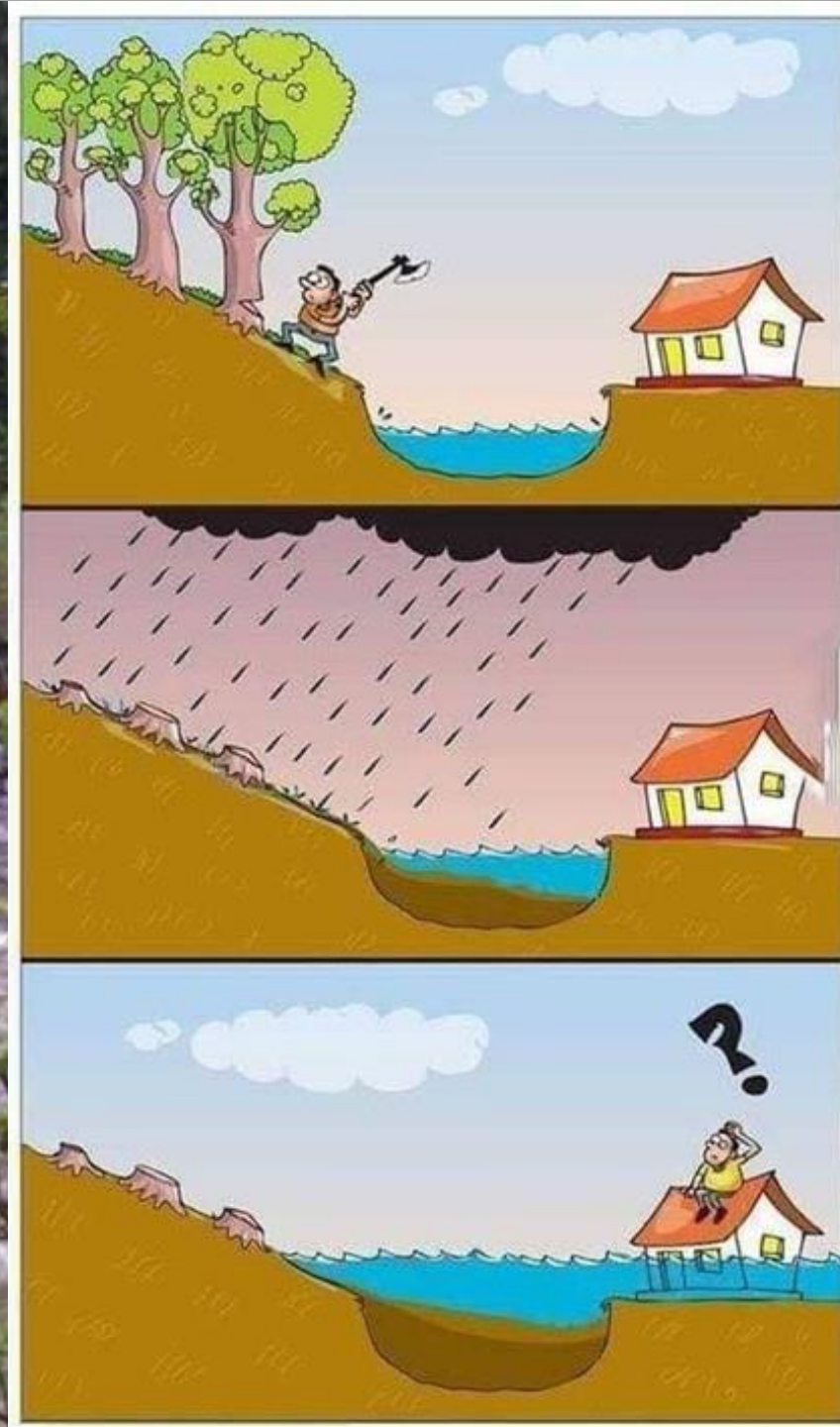
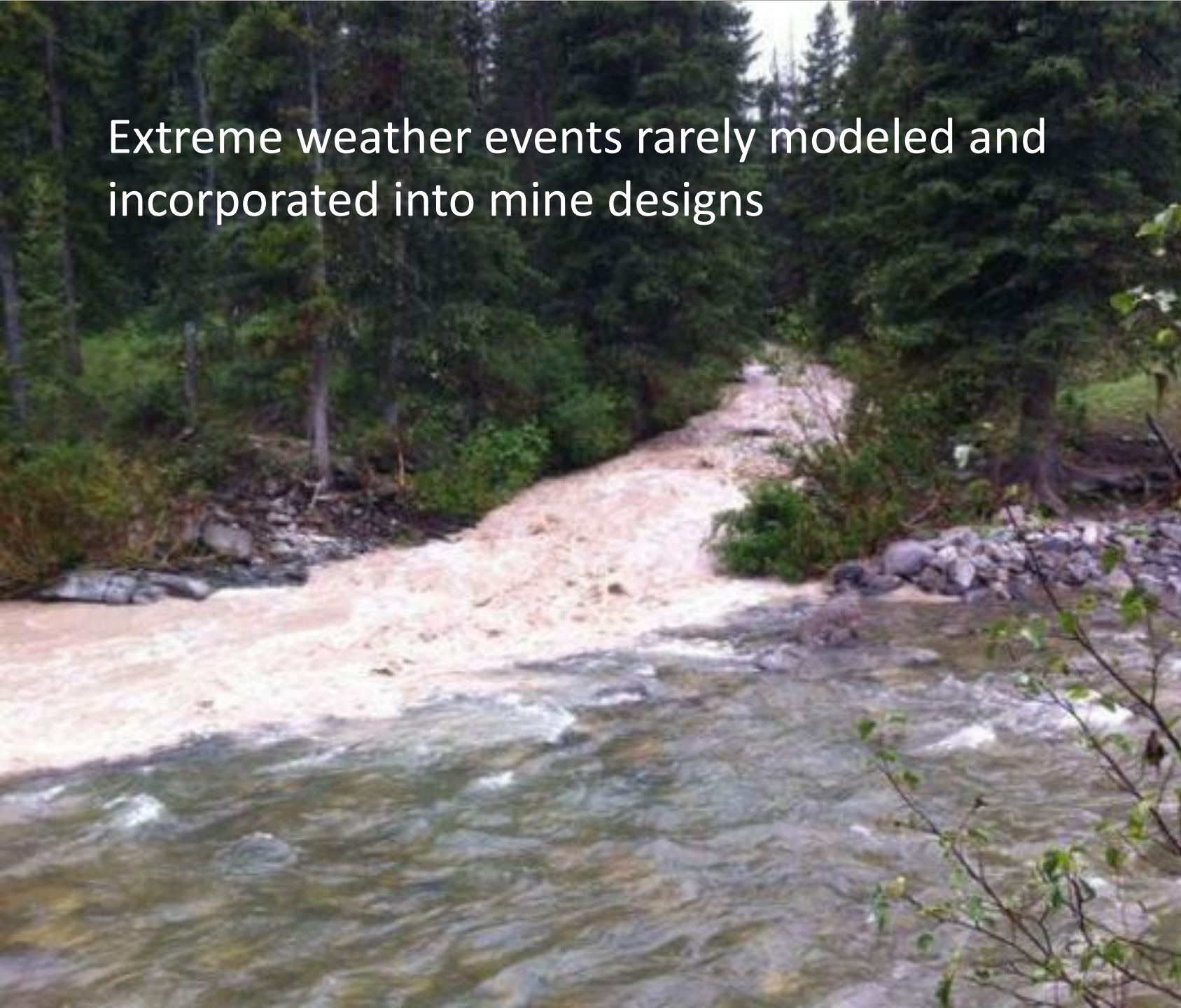
Coal mines increase erosion and sediment transport up to 1000Xs
that of undisturbed forest slopes

Sediment above background levels affects:

- physical habitat
- spawning
- incubation
- aquatic insects
- physiological stress
- survival



Extreme weather events rarely modeled and incorporated into mine designs



As a result there are operational
and structural failures



Massive, acute sediment releases

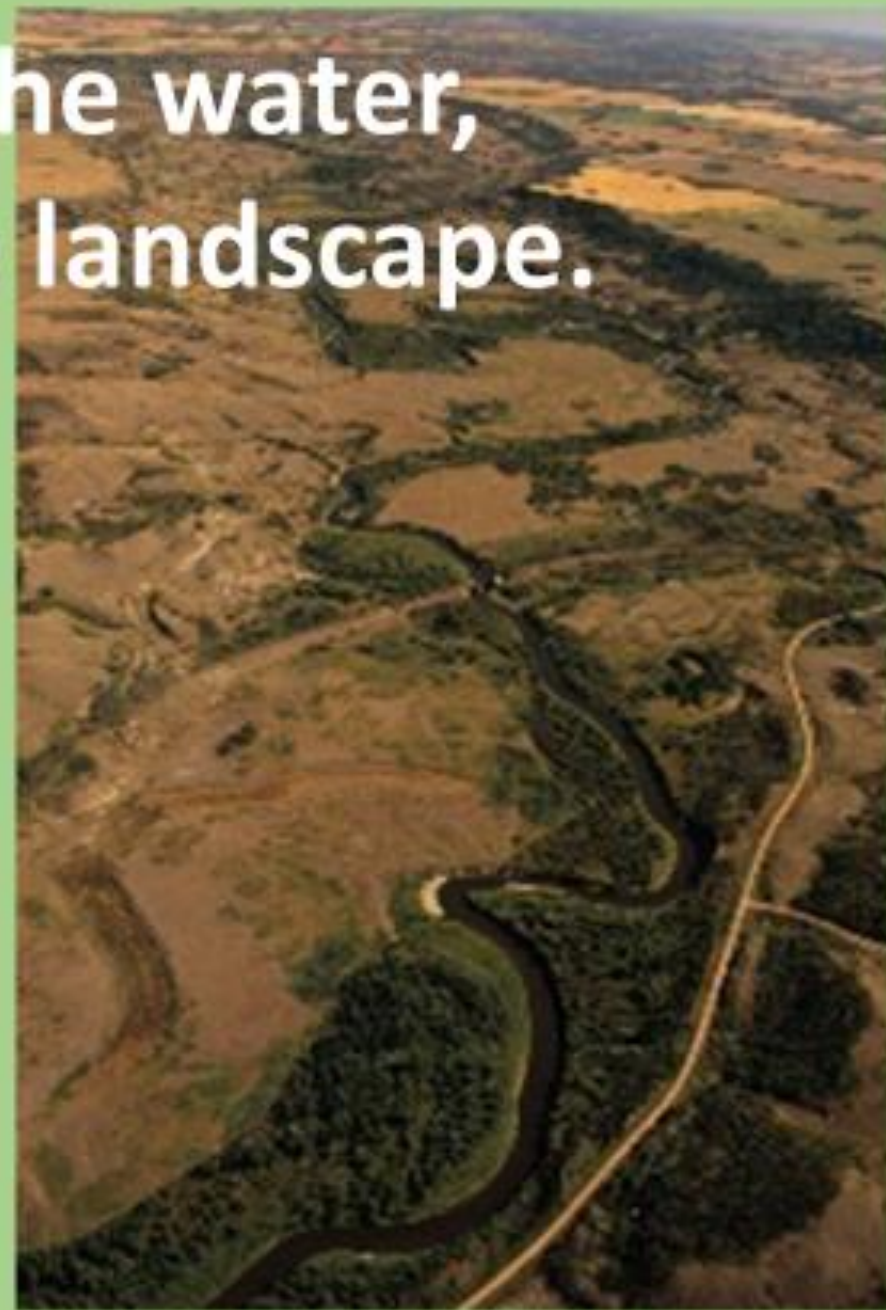
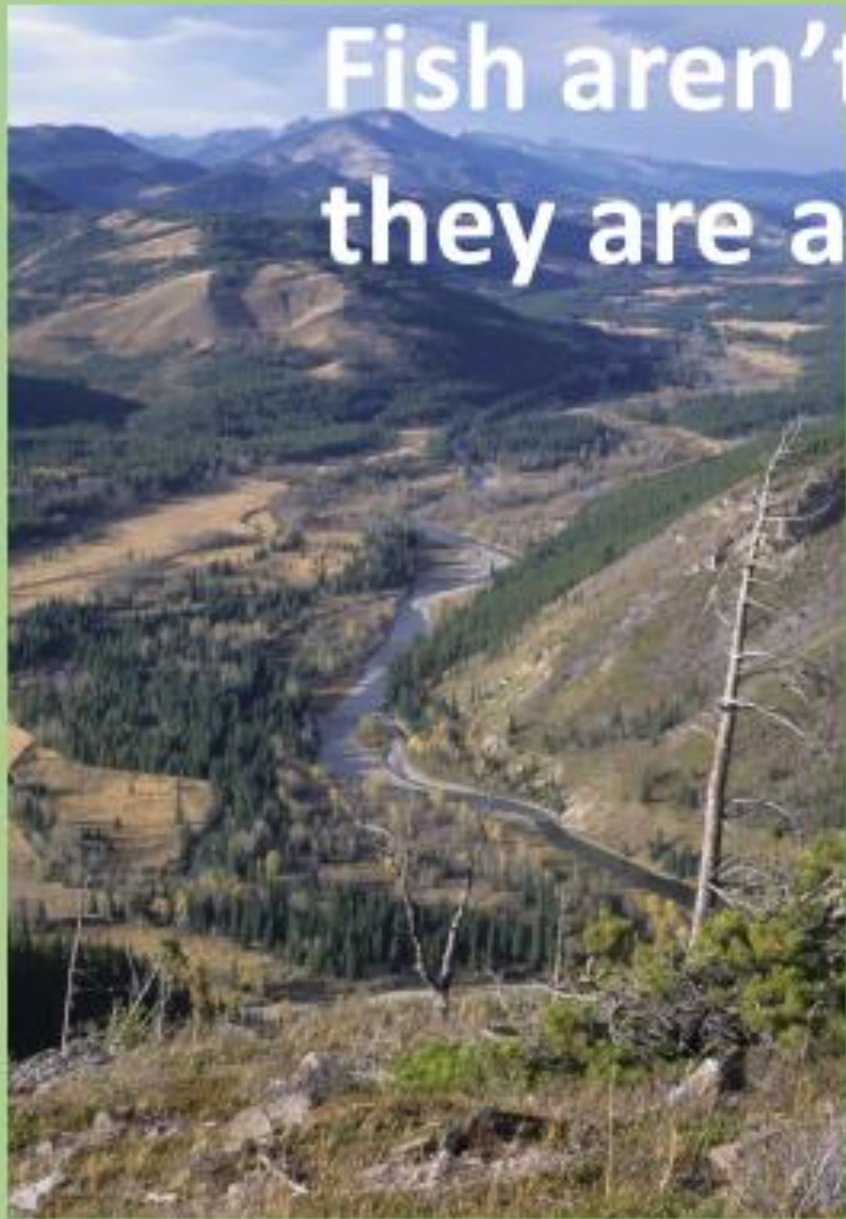


“It is axiomatic that nothing in engineering or in life, can be assured with 100% certainty”.

Mount Polley Independent Expert Engineering and Review Panel



Fish aren't a product of the water,
they are a product of the landscape.



What do the presence, abundance and distribution of fish tell us about the watershed?



Fish are:

- **Integrators**
- **Indicators**
- **Sentinels**



Cold, Clean, Complex, Connected

Warmer, Dirtier, Simpler, Fragmented

An aerial photograph of a massive open-pit coal mine. The mine's walls are terraced and show signs of erosion. A large processing plant with several buildings is visible in the upper right corner. The surrounding landscape is hilly and appears to be a mix of natural terrain and mining activity.

What do coal mines do to fish?

- loss of critical physical habitats
- declines in water quality and increases in contaminants
- hydrologic shifts
- chronic and acute sediment additions
- physiological impacts



Calcite





Se

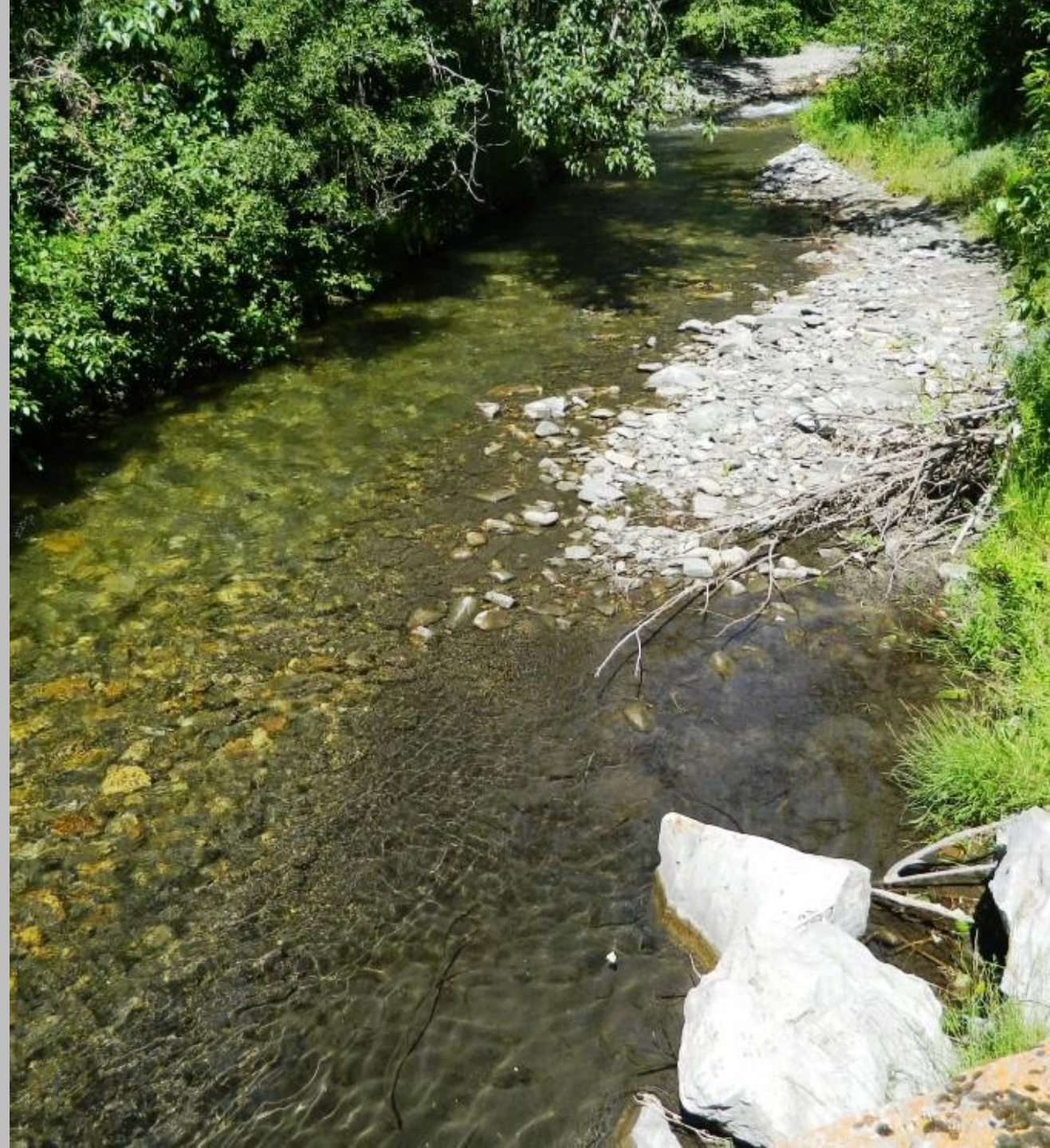


A 92% decrease in rainbow trout populations was observed in mine-affected streams and the decrease could only be explained by selenium exposure (Kuchapski and Rasmussen 2015).



No demonstrated, successful Se treatment exists, capable of reducing concentrations to safe levels, proven at mine scales and over long time periods.

The aquatic environment is harmed by coal mining and trout and coal mines cannot coexist



An aerial photograph showing a landscape heavily impacted by coal mining. A wide, dark, gravelly area, likely a tailings pile or a large-scale excavation, dominates the center and left of the frame. A winding, light-colored river or stream flows along the right edge, bordered by a dense forest of evergreen trees. A dirt road or path cuts through the landscape, separating the mining area from the forested region. The overall scene illustrates the environmental consequences of coal mining on a natural habitat.

What do coal mines do to wildlife?

- direct loss of habitat
- physiological stress and avoidance
- habitat fragmentation
- ecological processes altered
- population sink/source issues
- secondary and cumulative effects

Grizzly bears

Designated as “Threatened”, impacted by:

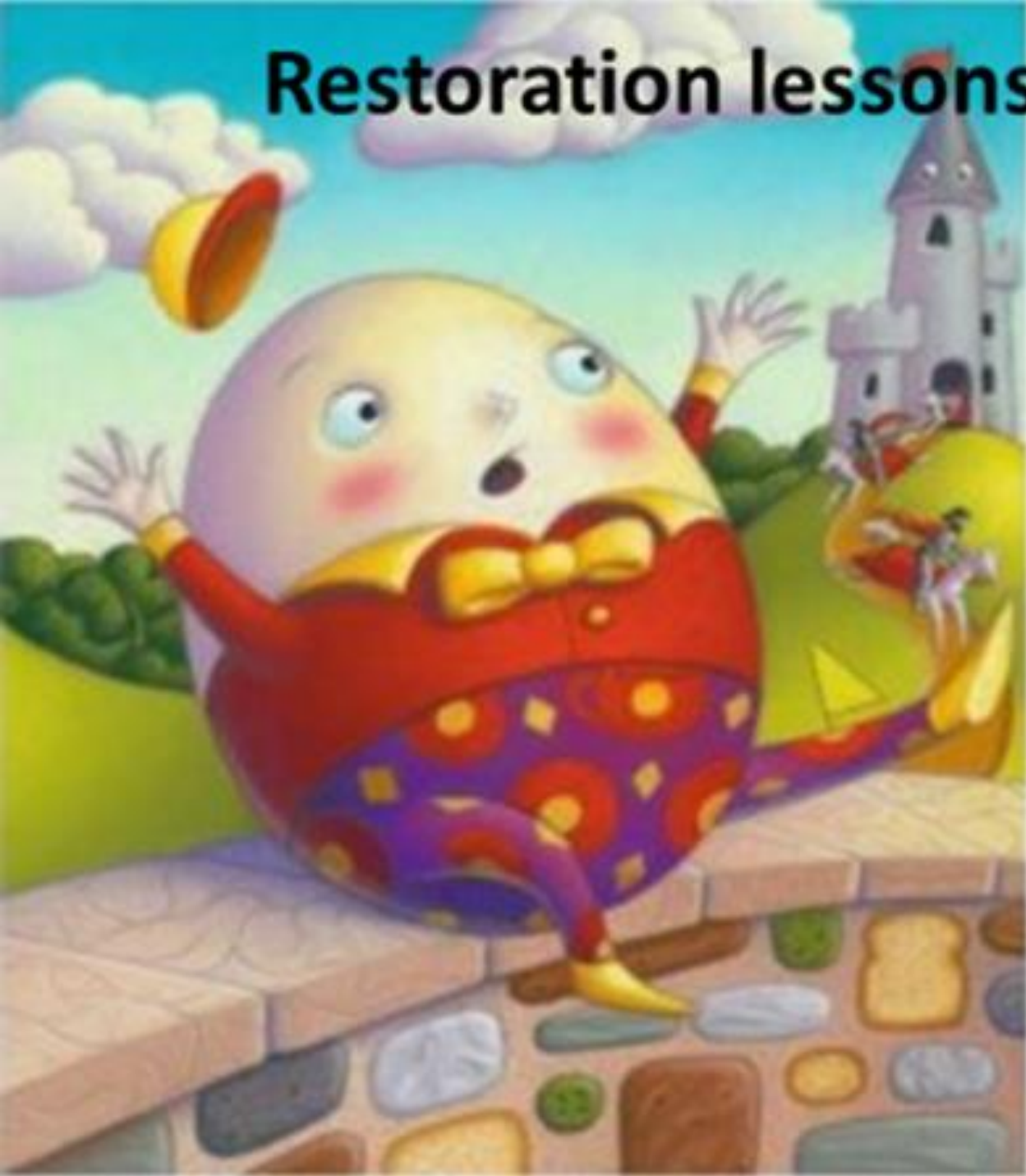
- road footprint
- recreational pressures
- industrial land uses
- the generation time for the species is less than the length of mining and reclamation so the learning process to understand habitat availability is problematic



Mitigation?



Restoration lessons from nursery rhymes

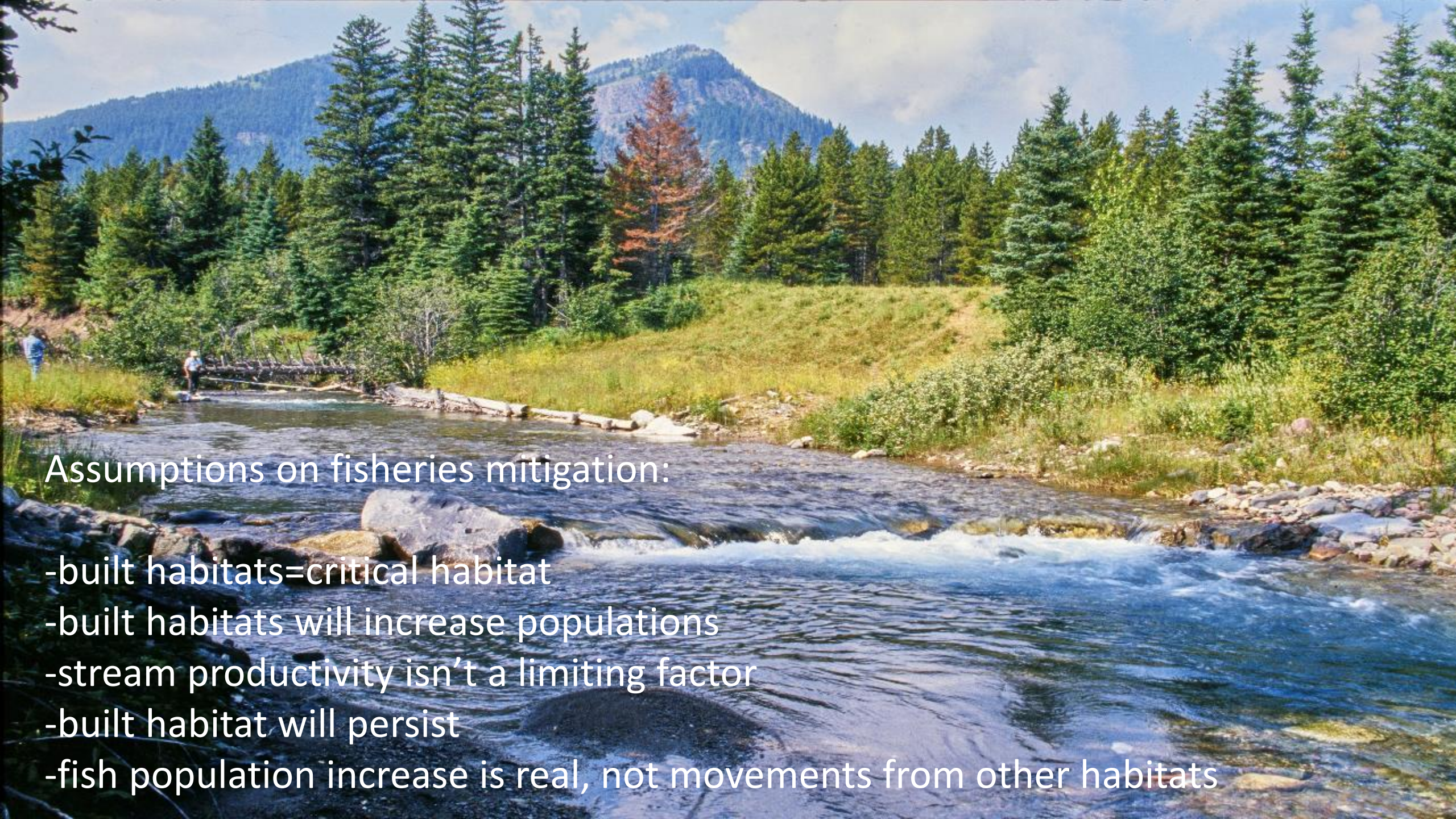


**Humpty Dumpty
Sat on a wall**

**Humpty Dumpty
Had a great fall**

**All the king's horses
And all the king's men**

**Couldn't put Humpty
Together again.**



Assumptions on fisheries mitigation:

- built habitats=critical habitat
- built habitats will increase populations
- stream productivity isn't a limiting factor
- built habitat will persist
- fish population increase is real, not movements from other habitats



In dynamic stream systems,
channel shifts and bedload
movement is common



An aerial photograph showing a complex river system with multiple channels, oxbow lakes, and meanders. The river channels are light brown, indicating sediment, and are surrounded by green vegetation. The landscape is a mix of water, land, and sediment. The text is overlaid on the upper left portion of the image.

In an alluvial system pools occur with a size and a frequency dependent on the meander wave length

Successful stream restoration is more than designing a channel



Ditch

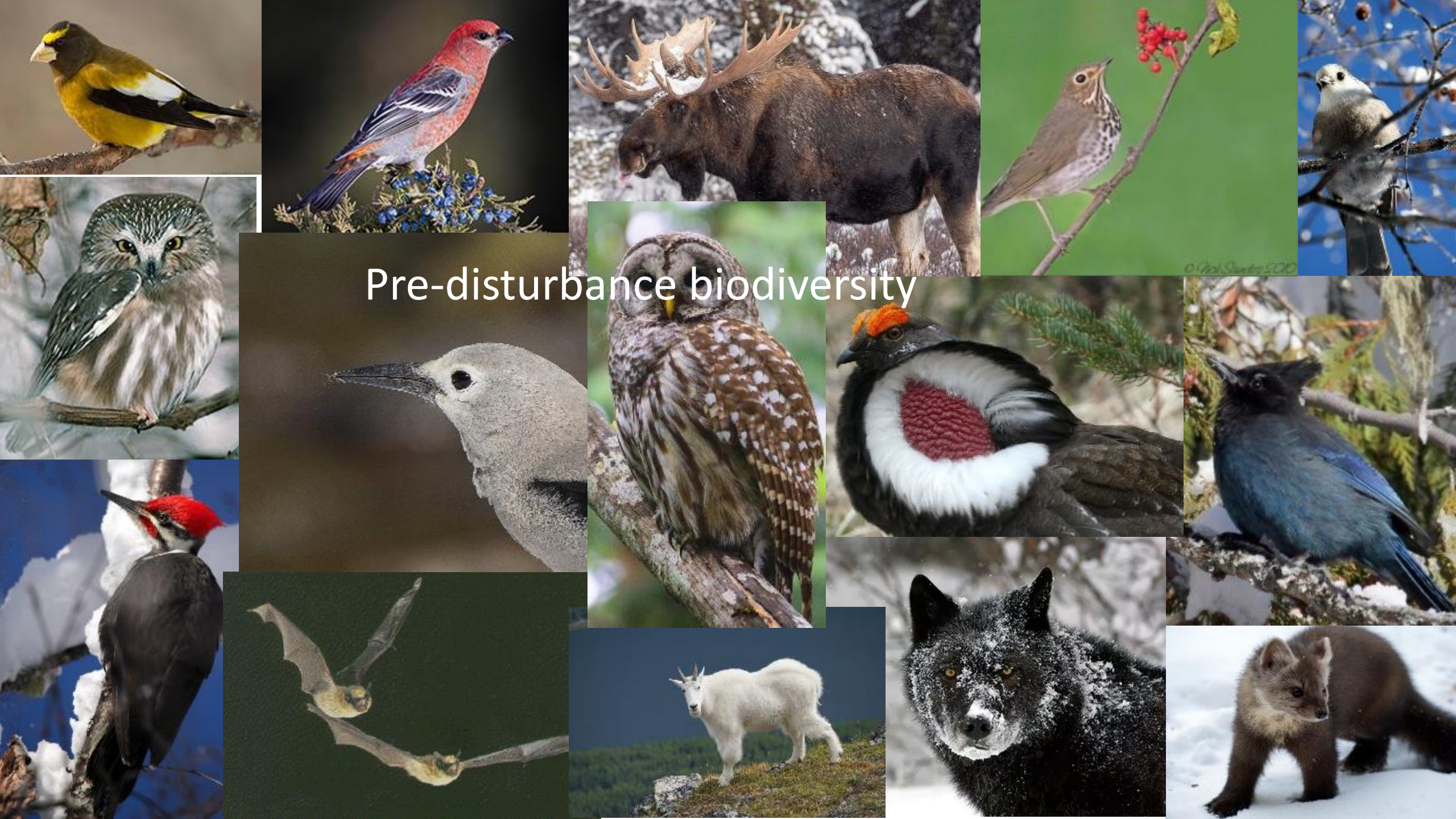


Trout habitat

Physical habitat retention of instream improvement structures

Area of survey	% retention
BC	55
Alaska	47
Oregon/Washington	40
Oldman Dam mitigation (pre 1995)	84
Oldman Dam mitigation (post 1995)	49
Southern East Slope streams (pre 1995)	63
Southern East Slope streams (post 1995)	19





Pre-disturbance biodiversity



Post-disturbance biodiversity




Winter range- critical source habitat



Native “hard” grass

“most difficult to restore”



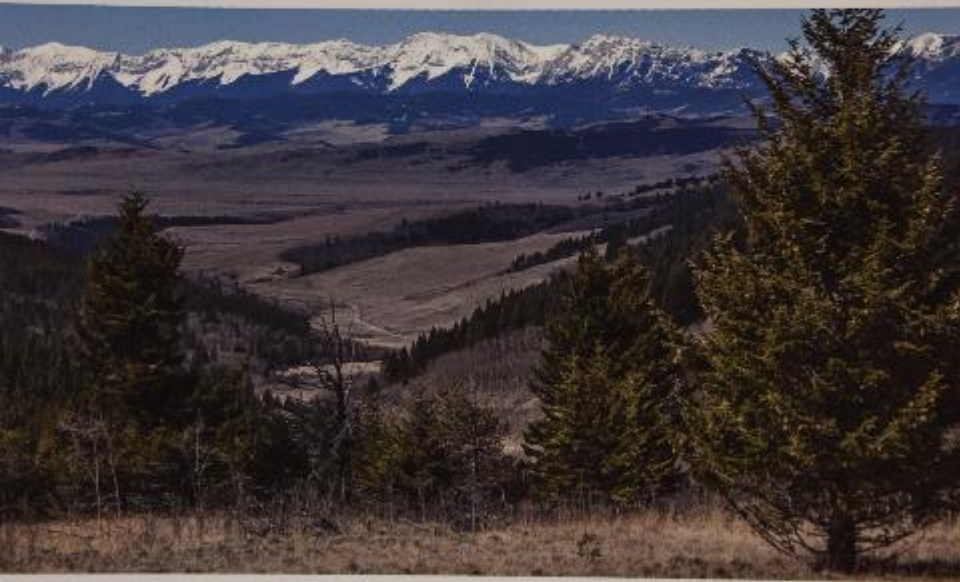
Non-native “soft” grass

Presence/absence monitoring
does not provide a full picture
of wildlife response to restoration



Wildlife presence is dependent
on adjacent, native, “source”
habitats

Livingstone- Porcupine Hills

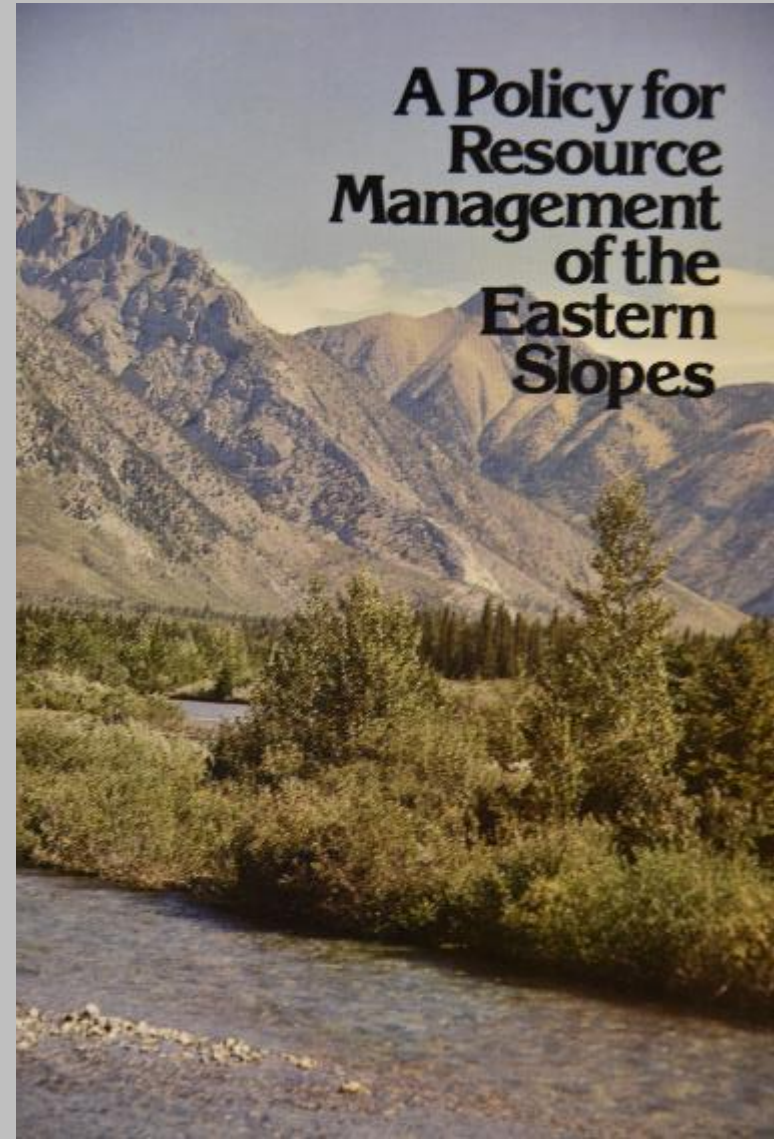


Land Footprint Management Plan

Alberta

Land use Planning

**A Policy for
Resource
Management
of the
Eastern
Slopes**





Science vs Everything Else



First-Land use plans
Then-Policy on sectors



Rules of the Earth:

What goes around, comes around

Everything is connected

Everything is additive

Diversity equals stability

We are in the loop

Conservation

Development



Pandora's Box of Coal Development in the Eastern Slopes

Our recommendation: Don't open it; if it's
open, close it; and, never open it again.





What should be in a “new” coal policy for Alberta’s Eastern Slopes:

- financial accountability for full costs of reclamation
- completion of reclamation at higher standards
- amelioration of water quality issues
- long-term monitoring and reporting
- long-term solution to settling ponds
- successful restoration of native trout populations
- recognition that coal mining no longer fits in the Eastern Slopes

